

WHAT IS CLAIMED IS:

1 1. An apparatus having an inter-module data transfer
2 confirming function comprising:
3 a first module;
4 a second module;
5 a bridge module connected said first module
6 and said second module through interface buses to
7 connect said first module and said second module to
8 each other so that data can be transferred between said
9 first module and said second module; and
10 a confirmation code setting means for setting,
11 in said bridge module, a confirmation code for
12 confirming data transfer from said bridge module to
13 said second module when said first module transfers
14 data to said second module via said bridge module
15 through said interface buses;
16 said first module comprising:
17 a descriptor setting means for
18 setting a data transfer descriptor containing
19 transfer information required for data transfer to
20 said second module and a data transfer confirmation
21 flag;
22 a descriptor generating means for
23 automatically generating, when said data transfer
24 confirmation flag is "ON", a data transfer
25 confirmation descriptor containing confirmation code

26 reading information, which is required to read out
27 said confirmation code from said bridge module to said
28 first module, on the basis of said transfer
29 information in said data transfer descriptor set by
30 said descriptor setting means; and

31 a controlling means for controlling
32 data transfer to said second module according to said
33 transfer information in said data transfer descriptor
34 set by said descriptor setting means, and for
35 controlling, when said data transfer confirmation
36 flag is "ON", after the data transfer to said second
37 module is completed, reading of said confirmation code
38 from said bridge module according to said confirmation
39 code reading information in said data transfer
40 confirmation descriptor automatically generated by
41 said descriptor generating means.

1 2. The apparatus having an inter-module data transfer
2 confirming function according to claim 1, wherein said
3 first module comprises:

4 a first processing unit for generally
5 managing said first module;

6 a second processing unit for carrying out
7 data transfer through said interface buses according
8 to an instruction from said first processing unit;

9 said first processing unit fulfilling a
10 function as said descriptor setting means; and

11 said second processing unit fulfilling
12 functions as said descriptor generating means and said
13 controlling means.

1 3. The apparatus having an inter-module data transfer
2 confirming function according to claim 1, wherein said
3 first module further comprises:

4 a first determining means for determining
5 whether data transfer between said bridge module and
6 said second module has been carried out normally or
7 abnormally, on the basis of said confirmation code
8 read out from said bridge module; and

9 a second determining means for determining
10 whether data transfer between said first module and
11 said bridge module has been carried out normally or
12 abnormally.

1 4. The apparatus having an inter-module data transfer
2 confirming function according to claim 3, wherein when
3 said first determining means determines that the data
4 transfer has been carried out abnormally, said
5 descriptor generating means automatically generates
6 an error reading descriptor containing error reading
7 information required to read out detailed error
8 information from said bridge module to said first
9 module, and said controlling means controls reading
10 of said detailed error information from said bridge

11 module according to said error reading information in
12 said error reading descriptor automatically
13 generated by said descriptor generating means.

1 5. The apparatus having an inter-module data transfer
2 confirming function according to claim 4, wherein said
3 first module comprises:

4 a first processing unit for generally
5 managing said first module;

6 a second processing unit for carrying out
7 data transfer through said interface buses according
8 to an instruction from said first processing unit;

9 said first processing unit fulfilling
10 functions as said descriptor setting means and said
11 second determining means; and

12 said second processing unit fulfilling
13 functions as said descriptor generating means, said
14 controlling means and said first determining means.

1 6. The apparatus having an inter-module data transfer
2 confirming function according to claim 5, wherein when
3 said second determining means determining that the
4 data transfer has been carried out abnormally, said
5 first processing unit obtains, from said second
6 processing unit, said detailed error information read
7 out from said bridge module, and instructs said second
8 processing unit to re-transfer the data on the basis

9 of said detailed error information.

1 7. The apparatus having an inter-module data transfer
2 confirming function according to claim 1, wherein when
3 a plurality of data blocks are successively
4 transferred from said first module to said second
5 module, said descriptor setting means sets only said
6 data transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 8. The apparatus having an inter-module data transfer
2 confirming function according to claim 2, wherein when
3 a plurality of data blocks are successively
4 transferred from said first module to said second
5 module, said descriptor setting means sets only said
6 data transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 9. The apparatus having an inter-module data transfer
2 confirming function according to claim 3, wherein when
3 a plurality of data blocks are successively
4 transferred from said first module to said second
5 module, said descriptor setting means sets only said
6 data transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1 10. The apparatus having an inter-module data transfer
2 confirming function according to claim 4, wherein when
3 a plurality of data blocks are successively
4 transferred from said first module to said second
5 module, said descriptor setting means sets only said
6 data transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 11. The apparatus having an inter-module data transfer
2 confirming function according to claim 5, wherein when
3 a plurality of data blocks are successively
4 transferred from said first module to said second
5 module, said descriptor setting means sets only said
6 data transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 12. The apparatus having an inter-module data transfer
2 confirming function according to claim 6, wherein when
3 a plurality of data blocks are successively
4 transferred from said first module to said second
5 module, said descriptor setting means sets only said
6 data transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1 13. A storage controlling apparatus disposed between
2 a disk unit and a host to control an access to said
3 disk unit from said host, said storage controlling
4 apparatus comprising:

5 a disk interface module for controlling an
6 interface with said disk unit;

7 a host interface module for controlling an
8 interface with said host;

9 a management module for generally managing
10 the whole of said apparatus;

11 a bridge module connected said disk interface
12 module, said host interface module and said management
13 module through interface buses to connect said disk
14 interface module, said host interface module and said
15 management module to one another so that data can be
16 transferred among said disk interface module, said
17 host interface module and said management module; and

18 a confirmation code setting means for setting,
19 in said bridge module, a confirmation code for
20 confirming data transfer from said bridge module to
21 said management module when said disk interface module
22 or said host interface module transfers data to said
23 management module via said bridge module through said
24 interface buses;

25 said disk interface module and/or said host

1 14. The storage controlling apparatus according to
2 claim 13, wherein said interface module comprises:
3 a first processing unit for generally
4 managing said interface module;
5 a second processing unit for carrying out
6 data transfer through said interface buses according
7 to an instruction from said first processing unit;
8 said first processing unit fulfilling a
9 function as said descriptor setting means; and
10 said second processing unit fulfilling
11 functions as said descriptor generating means and said
12 controlling means.

1 15. The storage controlling apparatus according to
2 claim 13, wherein said interface module comprises:
3 a first determining means for determining,
4 on the basis of said confirmation code read out from
5 said bridge module, whether data transfer between said
6 bridge module and said management module has been
7 carried out normally or abnormally; and
8 a second determining means for determining
9 whether data transfer between said interface module
10 and said bridge module has been carried out normally
11 or abnormally.

1 16. The storage controlling apparatus according to

2 claim 15, wherein when said first determining means
3 determines that the data transfer has been carried out
4 abnormally, said descriptor generating means
5 automatically generates an error reading descriptor
6 containing error reading information required to read
7 out detailed error information from said bridge module
8 to said interface module, and said controlling means
9 controls reading of said detailed error information
10 from said bridge module according to said error
11 reading information in said error reading descriptor
12 automatically generated by said descriptor
13 generating means.

1 17. The storage controlling apparatus according to
2 claim 16, wherein said interface module comprises:
3 a first processing unit for generally
4 managing said interface module;
5 a second processing unit for carrying out
6 data transfer through said interface buses according
7 to an instruction from said first processing unit;
8 said first processing unit fulfilling
9 functions as said descriptor setting means and said
10 second determining unit; and
11 said second processing unit fulfilling
12 functions as said descriptor generating means, said
13 controlling means and said first determining means.

1 18. The storage controlling apparatus according to
2 claim 17, wherein when said second determining unit
3 determines that the data transfer has been carried out
4 abnormally, said first processing unit obtains, from
5 said second processing unit, said detailed error
6 information read out from said bridge module, and
7 instructs said second processing unit to re-transfer
8 the data on the basis of said detailed error
9 information.

1 19. The storage controlling apparatus according to
2 claim 13, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 20. The storage controlling apparatus according to
2 claim 14, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 21. The storage controlling apparatus according to
2 claim 15, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 22. The storage controlling apparatus according to
2 claim 16, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 23. The storage controlling apparatus according to
2 claim 17, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 24. The storage controlling apparatus according to
2 claim 18, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 25. An interface module for a storage controlling
2 apparatus disposed between a disk unit and a host to
3 control an access from said host to said disk unit,
4 said storage controlling apparatus comprising said
5 interface module for controlling an interface with
6 said disk unit or said host, a management module for
7 generally managing the whole of said storage
8 controlling apparatus, a bridge module connected said
9 interface module and said management module through
10 interface buses to connect said interface module and
11 said management module to each other so that data can
12 be transferred between said interface module and said
13 management module, and a confirmation code setting
14 means for setting, in said bridge module, a
15 confirmation code for confirming data transfer from
16 said bridge module to said management module when said
17 interface module transfers data to said management

18 module via said bridge module through said interface
19 buses, said interface module comprising:
20 a descriptor setting means for setting a data
21 transfer descriptor containing transfer information
22 required for data transfer to said management module
23 and a data transfer confirmation flag;
24 a descriptor generating means for
25 automatically generating, when said data transfer
26 confirmation flag is "ON", a data transfer
27 confirmation descriptor containing confirmation code
28 reading information, which is required to read out
29 said confirmation code from said bridge module to said
30 interface module, on the basis of said transfer
31 information in said data transfer descriptor set by
32 said descriptor setting means; and
33 a controlling means for controlling data
34 transfer to said management module according to said
35 transfer information in said data transfer descriptor
36 set by said descriptor setting means, and for
37 controlling, when said data transfer confirmation
38 flag is "ON", after the data transfer to said
39 management module is completed, reading of said
40 confirmation code from said bridge module according
41 to said confirmation code reading information in said
42 data transfer confirmation descriptor automatically
43 generated by said descriptor generating means.

1 26. The interface module for a storage controlling
2 apparatus according to claim 25 comprising:

3 a first processing unit for generally
4 managing said interface module;

5 a second processing unit for carrying out
6 data transfer through said interface buses according
7 to an instruction from said first processing unit;

8 said first processing unit fulfilling a
9 function as said descriptor generating means; and

10 said second processing unit fulfilling
11 functions as said descriptor generating means and said
12 controlling means.

1 27. The interface module for a storage controlling
2 apparatus according to claim 25 further comprising:

3 a first determining means for determining
4 whether data transfer between said bridge module and
5 said management module has been carried out normally
6 or abnormally, on the basis of said confirmation code
7 read out from said bridge module; and

8 a second determining means for determining
9 whether data transfer between said interface module
10 and said bridge module has been carried out normally
11 or abnormally.

1 28. The interface module for a storage controlling
2 apparatus according to claim 27, wherein when said

3 first determining unit determines that the data
4 transfer has been carried out abnormally, said
5 descriptor generating means automatically generates
6 an error reading descriptor containing error reading
7 information required to read out detailed error
8 information from said bridge module to said interface
9 module, and said controlling means controls reading
10 of said detailed error information from said bridge
11 module according to said error reading information in
12 said error reading descriptor automatically
13 generated by said descriptor generating means.

1 29. The interface module for a storage controlling
2 apparatus according to claim 28 comprising:

3 a first processing unit for generally
4 managing said interface module;
5 a second processing unit for carrying out
6 data transfer through said interface buses according
7 to an instruction from said first processing unit;
8 said first processing unit fulfilling
9 functions as said descriptor setting means and said
10 second determining unit; and
11 said second processing unit fulfilling
12 functions as said descriptor generating means, said
13 controlling means and said first determining means.

1 30. The interface module for a storage controlling

2 apparatus according to claim 29, wherein when said
3 second determining means determines that the data
4 transfer has been carried out abnormally, said first
5 processing unit obtains, from said second processing
6 unit, said detailed error information read out from
7 said bridge module, and instructs said second
8 processing unit to re-transfer the data on the basis
9 of said detailed error information.

1 31. The interface module for a storage controlling
2 apparatus according to claim 25, wherein when a
3 plurality of data blocks are successively transferred
4 from said interface module to said management module,
5 said descriptor setting means sets only said data
6 transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 32. The interface module for a storage controlling
2 apparatus according to claim 26, wherein when a
3 plurality of data blocks are successively transferred
4 from said interface module to said management module,
5 said descriptor setting means sets only said data
6 transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 33. The interface module for a storage controlling
2 apparatus according to claim 27, wherein when a
3 plurality of data blocks are successively transferred
4 from said interface module to said management module,
5 said descriptor setting means sets only said data
6 transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 34. The interface module for a storage controlling
2 apparatus according to claim 28, wherein when a
3 plurality of data blocks are successively transferred
4 from said interface module to said management module,
5 said descriptor setting means sets only said data
6 transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 35. The interface module for a storage controlling
2 apparatus according to claim 29, wherein when a
3 plurality of data blocks are successively transferred
4 from said interface module to said management module,
5 said descriptor setting means sets only said data
6 transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".

1 36. The interface module for a storage controlling
2 apparatus according to claim 30, wherein when a
3 plurality of data blocks are successively transferred
4 from said interface module to said management module,
5 said descriptor setting means sets only said data
6 transfer confirmation flag in a data transfer
7 descriptor for transferring the last data block among
8 said plurality of data blocks to "ON".